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BILLING FOR USE OF A TELEPHONY DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application is related to the following co-pending applications:

(1) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010818US1);

(2) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010819US1);

(3) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010820US1);

(4) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010821US1);

(5) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010822US1);

(6) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010823US1);

(7) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010838US1);

(8) U.S. Patent Application Serial No. ___/_____ (Attorney

Docket No. AUS920010839US1);

(9) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010841US1);

(10) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010842US1); and

(11) U.S. Patent Application Serial No. ___/_____ (Attorney Docket No. AUS920010843US1).

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention relates in general to telecommunications and, in particular, to voice identification. Still more particularly, the present invention relates to billing a caller for use of an origin device.

2. Description of the Related Art:

Telephone service has created communication channels worldwide, and those channels continue to expand with the advent of cellular and other wireless services. A person can simply take a telephone off-hook and dial a destination number or press a send button and be connected to a telephone line around the world.

Today, the public switching telephone network (PSTN), wireless networks, and private networks telephone services are based on the identification of the wireless telephone or wireline that a calling party uses. Services are personalized according to wireless telephone or wireline telephone number, where services associated with one telephone number are not accessible for another telephone number assigned to the same subscriber. For example, there is typically a first set of service features and billing options assigned to a home line number, a second set of service features and billing options assigned to an office

line number, and a third set of service features and billing options assigned to a cellular telephone number. The networks process calls to and from each of these different subscriber telephones based on a separate telephone number.

One problem with personalizing services according to a line number is that a subscriber to the line number is billed for all services provided to the line number, regardless of who is actually utilizing the line number. In particular, where a wireline based telephone device associated with a particular line number is utilized by multiple people, the line subscriber will incur additional charges for those services that other callers utilize that are billed on a per use basis, such as long distance service.

While wireline service is typically billed at a flat rate for each month of use, use of a wireless service is typically billed at a rate for the actual use of a wireless service telephone device in placing and receiving calls. Charges associated with the actual use of a wireless service telephone device may include a charge per minute of use. In addition, use of a wireless device typically requires use of a battery resource.

Where a line subscriber loans a wireless service telephone device to a friend to place or receive a call, the line subscriber is also giving the cost of minutes used by the friend. Even though the friend may have a wireless service subscription, that subscription is not transferrable to the wireless telephone

device. Further, the subscriber is giving the battery power resource utilized to power the telephone device and the time that subscriber could be using the wireless service telephone device.

Therefore, in view of the foregoing, it would be advantageous to provide a method, system, and program for billing for use of a wireless service telephone device according to the billing plan of the caller actually utilizing the wireless service telephone device. In addition, it would be advantageous to provide a method, system, and program for charging callers, other than the device owner, for use of a telephone device, including a charge for loss of time available for use of the telephone device, loss of battery power, and other usage that may be charged as a tariff for use of another's telephone device.

SUMMARY OF THE INVENTION

In view of the foregoing, it is therefore an object of the present invention to provide an improved telecommunications system.

It is another object of the present invention to provide a method, system and program for improved voice identification.

It is yet another object of the present invention to provide a method, system and program for billing a caller for use of an origin device.

According to one aspect of the present invention, usage, of at least one measurable element of a telephony device by an identified individual, is tracked, where the identified individual is distinct from an owner of the origin telephony device. A tariff for the tracked usage is transferred to an intermediary device. The intermediary device charges the tariff according to a billing plan for the identified individual, such that the owner is compensated for use of at least one measurable element of the owner's telephony device. Measurable elements may include the time the telephony device is in the identified individual's possession, the battery usage, and usage of the address book.

All objects, features, and advantages of the present invention will become apparent in the following detailed written

description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 depicts a block diagram of a network environment in which the present invention may be implemented;

Figure 2 illustrates a block diagram of the flow of a caller identity authentication in accordance with the method, system, and program of the present invention;

Figure 3 depicts a block diagram of the flow of billing plans in accordance with the method, system, and program of the present invention;

Figure 4 illustrates an illustrative representation of the information within billing plans in accordance with the method, system, and program of the present invention;

Figure 5 depicts a flow diagram of a signal flow and processing of a call in accordance with the method, system, and program of the present invention;

Figure 6 illustrated a block diagram of a billing service in

accordance with the method, system, and program of the present invention; and

Figure 7 depicts a high level logic flowchart of a processing and program for controlling a billing service in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A method, system, and program for billing an identifiable individual for use of a telephony device are provided. For purposes of the present invention, a telephony device may include a wireline or wireless service based telephony device. In addition, a telephony device may include a call center, a private network system, a private switching system, and other systems that are enabled to originate or receive a call request.

In addition, for purposes of the present invention, an identifiable individual may also own the telephony device utilized for a call request. However, according to an advantage of the present invention, where an identifiable individual is not the owner of the telephony device, the identifiable individual is charged a tariff for use of the telephony device. In particular, an identifiable individual may be charged the time utilized by the identifiable individual, the cost of the telephony device not being available for use by the telephony device owner, use of battery power, and other measurable usage elements. Owning a telephony device may include owning the device itself and/or subscribing to the line number service provided to the device.

For purposes of the present invention, an identifiable individual may include either a caller or a callee. A telephony device may include both origin telephony devices and destination telephony devices. For purposes of simplification, the present invention is described with a focus on a caller utilizing an origin telephony device, however the invention is also applicable

for a callee utilizing a destination telephony device, a caller using a destination telephony device, and a callee using an origin telephony device.

First, an identity of a caller utilizing the origin device is authenticated. Caller identity authentication may be initiated by the origin device originating the call, the intermediary device processing the call, or the destination device receiving the call. Each of the devices may access a third party or external server to perform the caller identity authentication. Performance of caller identity authentication has different advantages depending on the device initiating the caller identity authentication.

While in the present invention, authentication of a caller identity is described with emphasis placed on voice authentication, other methods of caller identity authentication may also be performed. Voice samples utilized for voice authentication are just one of multiple types of biometric sampling. For example, a caller may locally provide an eye scan, a fingerprint, and other biophysical identifiers that are transmitted within or outside the trusted network to autnenticate the identity of the caller. Alternatively, keypad entries, such as a pin code, account number, password, or other secure transaction key may be entered by a caller and utilized to authenticate the identity of the caller.

Next, a caller profile is accessed according to the authenticated identity of the caller utilizing the origin device.

The caller profile includes a billing plan and services requested by the caller. The caller profile may be accessed from a service provider within the trusted telephone network and/or from external servers functioning outside the trusted telephone network, where the caller has selected to disclose caller profile information at those external servers.

The call is then processed according to the services and billing plan of the caller. Advantageously, by specifying the billing for use of an origin device according to the caller utilizing the device, rather than the device owner, the device owner is not billed for telephone services provided to another.

According to an advantage of the present invention, the origin device may track usage of measurable elements of the origin device. The tracked usage of measurable elements is then utilized to charge the caller a tariff for use of the origin device. Therefore, in addition to billing the caller for the telephone services provided by a service provider, the caller is billed for the measurable usage of elements of the origin device. For example, a line subscriber may designate a tariff for possession of a wireless telephony device by non-owners. Therefore, the caller billing plan is charged for the wireless telephone service, but the caller is also charged a tariff for possession of the wireless telephony device itself, such that the owner is compensated for time that the caller placed the wireless telephony device out of use by the owner.

In particular, while use of the origin device may be tracked

concurrently with a call originated from the origin device, use of the origin device independent of a call may also be tracked. For example, where a caller utilizes an origin device to access an address book, the usage of the address book and the battery usage while accessing the address book may be tracked and charged to the caller as a tariff.

For purposes of the present invention, a caller preferably subscribes to a telephone service from at least one service provider. That service may be linked to a particular line number, but preferably follows the caller to whatever telephone device the caller chooses to utilize. The service may include a billing plan that provides for services in addition to basic telephone service, at a flat rate. In addition, the billing plan may provide for other services, in addition to basic telephone service, that are billable according to use, such as long distance service. Further, the billing plan may provide for transferring micropayments or other methods of paying tariffs charged for use of origin devices.

For purposes of the present invention, telephony devices are termed origin devices when utilized for origination of a call to an intermediary device and are termed destination devices when utilized for receipt of a call from an intermediary device. Subscribers are termed callers when originating a call and are termed callees when receiving a call.

In the following description, for the purposes of explanation, numerous specific details are set forth to provide a thorough understanding of the present invention. It will be

apparent, however, to one skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form to avoid unnecessarily obscuring the present invention.

With reference now to the figures, and, in particular, with reference now to **Figure 1**, there is depicted a block diagram of a network environment in which the present invention may be implemented. While the present invention is described with reference to one type of network environment, it will be understood by one with skill in the art that the present invention may be implemented in alternate types of network environments.

GENERAL NETWORK ENVIRONMENT

First, the network environment incorporates a Public Switching Telephone Network (PSTN) **10**. As is known in the art the core of PSTN **10** may include multiple telephone networks, each owned by one of multiple independent service providers. Each telephone line is carried by an independent service provider within PSTN **10** and is typically assigned to at least one subscriber.

Switching of a call within an independent service provider's telephone network is considered trusted movement within a trusted network because the call remains within the company's telephone network infrastructure. However, calls may be transferred from

one service provider's telephone network to another service provider's telephone network in generally trusted movement. Generally, service providers are in competition with one another and therefore there is general trust in transferring a call, but not trust in sharing of subscriber information beyond a subscriber number and name from one service provider to the next without security features or other arrangements.

Advantageously, each telephone network within PSTN **10** may access a data network functioning as an extension to PSTN **10** via an Intranet. Data networks may include, for example, subscriber profiles, billing information, and preferences that are utilized by a service provider to specialize services. Transfer of information between a service provider's data network and telephone network is trusted movement in sharing of information.

Further, each telephone network within PSTN **10** may access server systems external to PSTN **10** in the Internet Protocol over the Internet or an Intranet. Such external server systems may include an enterprise server, an Internet service provider (ISP), an access service provider (ASP), a personal computer, and other computing systems that are accessible via a network. In the present embodiment, transfer of information between PSTN **10** and server systems accessible via a network **20** is untrusted and therefore may require verification and additional security. Network **20** may be preferably considered an external network.

In the present invention, network **20** may comprise a private network, an Intranet, or a public Internet Protocol network.

Specifically, telco application server **22**, generic application server **24**, pervasive application server **26**, and systems management server **28** represent server systems external to PSTN **10** that may be accessed by PSTN **10** over network **20**.

In particular, telco application server **22** preferably includes multiple telco specific service applications for providing services to calls transferred to a server external to PSTN **10**. In particular, a call may be transferred from PSTN **10** to telco application server **22** to receive at least one service and then the call is transferred back to PSTN **10**. PSTN 10 preferably brokers the connection between the telephony device and telco application server **22**. Such services may also be provided to calls within PSTN **10**, however placing such services at a third party such as telco application server **22,** is advantageous because adding services and information to PSTN **10** is time consuming and costly when compared with the time and cost of adding the services through telco application server **22**.

In accord with an advantage of the present invention, as will be further described, the identity of both the caller and the callee may be authenticated by one of telephony devices **8a-8n**, PSTN **10,** or by telco application server **22**. By authenticating the actual identity of the person making a phone call and the person receiving the phone call, rather than the identification of a device from which a call is made and received, an enhanced specialization of services to subscribers may be performed.

An authentication service within telco application server **22** may include identification and verification of the identity of a caller and/or callee of a particular call. Such a service may require that subscribers provide voice samples when setting up a subscription. The stored voice samples may then be compared against voice samples received for a particular call in order to authenticate the identity of a current caller or callee of the particular call.

Generic application server **24** preferably accesses independent server systems that provide services. For example, a messaging server, a financial server, an Internal Revenue Service (IRS) server, and database management system (DBMS) server may be accessed in HTTP via network **20**. Each of these servers may include a telco service application that requires authentication of the subscriber before access is granted. For example, a financial server may provide a telco service application that allows an authenticated subscriber to access current financial records and request stock quotes from the financial server.

Pervasive application server **26** manages services for wirelessly networked devices. In particular, pervasive application server **26** preferably handles distribution of wireless packets of voice and data to wirelessly networked devices utilizing a standard such as short messaging service (SMS) messaging or other 3G standards.

Systems management server **28** manages subscriber

personalization via the web. In particular, systems management server **28** includes browser technology that includes a provisioning console **30** for establishing a subscriber profile and a management console **32** for managing and updating the subscriber profile. A subscriber preferably accesses the consoles of systems management server **28** via the Internet utilizing a computing system, such as computing systems **34a-34n**.

The subscriber profile may be accessed at systems management server **28** by other external servers and PSTN **10** via network **20**. In addition, a local copy of a subscriber profile updated in systems management server **28** may be stored within a particular service provider's data network or telephone network. Each service provider may specify the types of preferences and other information included within a subscriber profile.

In particular, a subscriber may provide a voice imprint when establishing a subscriber profile through provisioning console **30**. Other types of authentication information may also be provided including, but not limited to, a password, an eye scan, a smart card ID, and other security devices. In addition, a subscriber may designate billing preferences, shopping preferences, buddy list preferences, and other preferences that enable specialized service to the subscriber when the subscriber's identity is authenticated from the voice imprint or other identification.

Advantageously, a management agent is built into each external server to monitor the services provided by each server

according to the authenticated subscriber receiving the services. By monitoring service output according to subscriber, the subscriber may then be billed according to each use of a service.

PSTN **10** preferably includes both voice and data signaling networks that interface with network **20** via gateways. Each of the gateways acts as a switch between PSTN **10** and network **20** that may compress a signal, convert the signal into Internet Protocol (other protocol) packets, and route the packets through network **20** to the appropriate server.

In particular, the voice network interfaces with network **20** through media gateway **14** which supports multiple protocol gateways including, but not limited to, SIP. SIP is a signaling protocol for Internet conferencing, telephony, presence, events notification and instant messaging.

In addition, in particular, the data signaling network interfaces with network **20** through signaling gateway **12** which supports multiple protocol gateways including, but not limited to, parlay protocol gateways and SS7 protocol gateways. Internet servers, such as telco application server **22** may include protocol agents that are enabled to interact with multiple protocols encapsulated in Internet Protocol packets including, but not limited to, SS7 protocol, parlay protocol, and SIP.

IDENTITY AUTHENTICATION AND CALL CONTROL

Looking into PSTN **10**, a telephone network typically includes

multiple switches, such as central office switches **11a-11n**, that originate, terminate, or tandem calls. Central office switches **11a-11n** utilize voice trunks for transferring voice communications and signaling links for transferring signals between signaling points.

Between signaling points, one central office switch sends signaling messages to other central office switches via signaling links to setup, manage, and release voice circuits required to complete a call. In addition, between signaling points, central office switches **11a-11n** query service control points (SCPs) **15** to determine how to route a call. SCPs **15** send a response to the originating central office switch containing the routing number(s) associated with the dialed number.

SCPs **15** may be general purpose computers storing databases of call processing information. While in the present embodiment SCPs **15** are depicted locally within PSTN **10**, in alternate embodiments SCPs **15** may be part of an extended network accessible to PSTN **10** via a network.

One of the functions performed by SCPs **15** is processing calls to and from various subscribers. For example, an SCP may store a record of the services purchased by a subscriber, such as a privacy service. When a call is made to the subscriber, the SCP provides record of the privacy service to initiate an announcement to a caller to identify themself to the subscriber with the privacy service who is being called. According to an advantage of the invention, authentication of the subscriber

receiving the call may be required before the privacy service is initiated for that subscriber.

In particular, network traffic between signaling points may be routed via a packet switch called an service transfer point (STP) **13**. STP **13** routes each incoming message to an outgoing signaling link based on routing information. Further, in particular, the signaling network may utilize an SS7 network implementing SS7 protocol.

Central office switches **11a-11n** may also send voice and signaling messages to intelligent peripherals (IP) **17** via voice trunks and signaling channels. IP **17** provides enhanced announcements, enhanced digit collection, and enhanced speech recognition capabilities.

According to an advantage of the present invention, the identity of a caller is authenticated according to voice authentication. Voice authentication is preferably performed by first identifying a subscriber by matching the name or other identifier spoken with a subscriber name or identifier. Next, voice authentication requires verifying that the voice audio signal matches that of the identified subscriber. However, in alternate embodiments, the identity of a subscriber may be authenticated according to passwords, eye scans, encryption, and other security devices.

In particular, to perform subscriber authentication of audio signals received from callers, IP **17** may include storage for

subscriber specific templates or voice feature information, for use in authenticating subscribers based on speech. If a subscriber specific template is not stored on a local IP **17**, then a remote IP containing the subscriber specific template may be accessed via a network. In addition, local IP **17** may access systems management server **28** or another repository for voice imprints to access the subscriber specific template.

Where IP **17** authenticates the identity of a caller (e.g. the subscriber placing a call), a voice identifier (VID) representing the authenticated caller identity is transferred as a signal for identifying the caller. In addition, where IP **17** authenticates the identity of a callee (e.g. the subscriber receiving a call), a reverse VID (RVID) including the callee identity is transferred as a signal for identifying the callee.

Alternatively, to perform subscriber authentication of audio signals received from callers, PSTN **10** may broker a caller identity authentication service from telco application server **22**. In particular, a signaling channel is opened between central office switches **11a-11n** and telco application server **22** via signaling gateway **12**. In addition, a voice channel is opened between central office switches **11a-11n** and telco application server **22** via media gateway **14**.

Because telco application server **22** is located outside of the trusted network, there may be a time delay associated with establishing a connection to telco application server **22** and authenticating the identity of a caller that is longer than a

time delay present where a caller identity is authenticated by IP **17**.

In addition, because telco application server **22** is located outside of the trusted network, it is advantageous to establish a level of security for transactions between telco application server **22** and central office switches **11a-11n**, wherein the level of security is suitable for untrusted communications. A level of security may be implemented by by utilizing security based protocols, such as the secure socket layer, and by applying ordinary encryption. In particular, the level of security preferably protects the communication channel between telco application server and PSTN **10** and authenticates the identity of the server from which a caller identity authentication service is accessed. Therefore an additional feature of signaling gateway **12** and media gateway **14** is security verification.

Advantageously, VIDs indicate through text, voice, or video the identity of a caller. For example, a caller's name may be transferred as the identity of a caller. Alternatively, a video clip stored with the subscriber template may be transferred as the identity of a caller. Additionally, VIDs may indicate the identity of the device utilized by a caller to provide context for a call. Further, VIDs may indicate which system or systems have authenticated the caller identity.

After a VID and/or RVID are determined by IP **17**, IP **17** and SCP **15** may communicate to designate which services are available according to VID and RVID. Advantageously, by designating

services according to a VID and/or RVID, subscribers are provided with services and billed for those services independent of the devices utilized by subscribers. In particular, a 1129 protocol or other protocol may be utilized to enable signal communications between IP **17** and SCPs **15**.

In addition, as previously described, caller authentication to determine VIDs and RVIDs may be performed by an external system, such as telco application server **22**. The VID or RVID returned from telco application server **22** may be transferred from central office switches **11a-11n** to SCP **15** in order to access a subscriber profile associated with the VID or RVID. Alternatively, the VID or RVID may first transfer to IP **17**, where additional verification of the caller identity is performed. For example, IP **17** may control distribution of the VID to the caller, where the caller is prompted to enter a password or additional information. IP **17** may then initiate loading the caller profile into central office switches **11a-11n** if the additional caller input is verifiable for the VID.

An origin telephony device or destination telephony device may also determine a VID and/or RVID for the caller and/or callee of a call. In particular, telephony devices **8a-8n** and call centers **16a-16n** may function as origin and destination telephony devices. Each of the telephony devices may include a database of voice templates that may be matched to authenticate the identity of a caller or callee. In addition, each of the telephony devices may access a third party, such as telco application server **22**, to authenticate the identity of the caller or callee.

In either case, the telephony device transmits a VID and/or RVID with a call to PSTN **10**.

Telephony devices **8a-8n** may include, but are not limited to wireline devices, wireless devices, pervasive device equipped with telephony features, a network computer, a facsimile, a modem, and other devices enabled for network communication. Advantageously, as previously described, a voice authentication functioning device may be included in each of telephony devices **8a-8n**.

In addition, telephony devices **8a-8n** may each incorporate a display that provides a visual output of a VID or RVID. Alternatively, such a display may be provided in a separate device connected to the line in parallel to telephones **8a-8n**. According to one advantage of the present invention, the identity of the actual caller or actual callee are output to a display in association with a call. In addition, other context information about the caller including, but not limited to, the device from which the call originates or is answered, ratings for a caller or callee, and other context information may be output to a display in association with a call.

Telephony devices **8a-8n** are communicatively connected to PSTN **10** via wireline, wireless, ISDN, and other communication links. Preferably, connections to telephony devices **8a-8n** provide digital transport for two-way voice grade type telephone communications and a channel transporting signaling data messages in both directions between telephony devices **8a-8n** and PSTN **10**.

In addition to telephony devices **8a-8n**, advanced telephone systems, such as call centers **16a-16n**, may be communicatively connected to PSTN **10** via wireline, wireless, ISDN and other communication links. Call centers **16a-16n** may include PBX systems, hold queue systems, private network systems, and other systems that are implemented to handle distribution of calls to multiple representatives or agents.

Returning to central office switches **11a-11n**, typically, one central office switch exists for each exchange or area served by the NXX digits of an NXX-XXXX (seven digit) telephone number or the three digits following the area code digits (NPA) in a ten-digit telephone number. The service provider owning a central office switch also assigns a telephone number to each line connected to each of central office switches **11a-11n**. The assigned telephone number includes the area code (NPA) and exchange code (NXX) for the serving central office and four unique digits (XXXX).

Central office switches **11a-11n** utilize office equipment (OE) numbers to identify specific equipment, such as physical links or circuit connections. For example, a subscriber's line might terminate on a pair of terminals on the main distribution frame of one of central office switches **11a-11n**. The switch identifies the terminals, and therefore a particular line, by an OE number assigned to that terminal pair. For a variety of reasons, a service provider may assign different telephone numbers to the one line at the same or different times. For

example, a local carrier may change the telephone number because a subscriber sells a house and a new subscriber moves in and receives a new number. However, the OE number for the terminals and thus the line itself remains the same.

On a normal call, a central office switch will detect an off-hook condition on a line and provide a dial tone. The switch identifies the line by the OE number. The central office switch retrieves profile information corresponding to the OE number and off-hook line. Then, the central office switch receives the dialed digits from the off-hook line terminal and routes the call. The central office switch may route the call over trunks and possibly through one or more central office switches to the central office switch that serves the called party's station or line. The switch terminating a call to a destination will also utilize profile information relating to the destination, for example to forward the call if appropriate, to apply distinctive ringing, etc.

In the present invention, once a VID for a caller is received at one of central office switches **11a-11n**, a profile for the caller is requested from SCP **15** or an external server accessible via network **20**. The returned caller profile is loaded into a call register of one of central office switches **11a-11n**. In particular, depending on the service provider included in a caller profile, the call may be switched to one of central office switches **11a-11n** that is associated with the service provider. The telephone service provided to the caller is then billed according to the caller billing plan.

In addition, in the present invention, telephony devices **8a-8n** may be equipped to monitor usage of measurable elements of telephony devices **8a-8n**. For example, telephony devices **8a-8n** may monitor minutes of device usage, battery usage, and usage of other measurable elements. Alternatively, IP **17** or an external server accessible via network **20** may monitor usage of measurable elements of telephony devices **8a-8n**.

For a particular call, one of telephony devices **8a-8n**, or other elemetns monitoring usage, may transfer the monitored usage to one of central office switches **11a-11n**, where the central office switch transfers the monitored usage according to the caller billing plan. Telephony devices **8a-8n** may also calculate the caller tariff for the monitored usage. In particular, the monitored usage and caller tariff may be transferred to SCP **15** or another data storage system for storage in association with a caller VID. In another example, the monitored usage and caller tariff may be transferred to a caller billing service accessible via network **20** according to VID, where the caller billing service then charges the caller for the caller tariff and transfers a micropayment for the caller tariff via network **20** to SCP **15** for storage in the device owner profile.

As another alternative to dialed digits from the off-hook line terminal, a caller may utilize a voice calling function of a telephony device for indicating how the call should be routed. For example, a caller may say the name of a preferred callee. The device or IP **17** may determine a person within the caller's

calling list that matfches the voiced name. The matching person's digits are then utilized to route the call.

VID AUTHENTICATION CONTEXT

Referring now to **Figure 2**, there is illustrated a block diagram of the flow of a caller identity authentication in accordance with the method, system, and program of the present invention.

Origin device **40** is utilized by a caller to initiate a call. The caller is prompted by the device performing caller authentication to provide a voice utterance. A VID for the caller is provided to intermediary device **42** from the device performing caller authentication. The VID is utilized to access a caller profile that includes service preferences and billing information. In addition, the VID is transmitted with the call to destination device **44** for identifying the caller.

In general, caller identity authentication is performed by receiving a voice utterance from a caller, analyzing the voice utterance for sound qualities and content, and attempting to match the sound qualities and content of a voice utterance to a voice template previously recorded for a caller, in order to authenticate the identity of the caller. If there is a match between the voice utterance and a voice template, then a VID is determined for the caller and utilized to authenticate the caller identity for retrieving a caller profile and billing the caller.

Caller identity authentication may be initiated by origin device **40**. In particular, origin device **40** may include voice templates and a feature for performing the caller identity authentication. In addition, origin device **40** may access a third party server **48** via network **20**, where third party server **48** may provide access to a database of voice templates and/or perform the caller identity authentication. Origin device **40** then transmits a VID determined for the caller to intermediary device **42** for use in specifying services and billing for a call from origin device **40**. Origin device **40** may include a caller telephony device, a PBX, a call center, a private switching system, network servers, feature servers, and other systems which provide call origination. Third party server **48** may include a telco application server, a generic application server, a database management system server, and other systems that function outside trusted telephone network **46**. In particular, intermediary device **42** may facilitate communication between origin device **40** and network **20**.

In addition, caller identity authentication may be initiated by intermediary device **42**. Intermediary device **42** may include database systems that store voice templates and an IP for performing caller identity authentication. In addition, intermediary device **42** may access telco application server **22** outside of trusted telephone network **46** via network **20**, where telco application server **22** provides a caller authentication service and/or provides access to a database of voice templates.

Intermediary device **42** may include a PSTN switching network or networks. However, intermediary device **42** may also include a PBX, a call center, or other private switching system. Further, intermediary device **42** may include network servers, Websphere® (Websphere® is a registered trademark of International Business Machines Corporation) servers, and other systems which provide call processing.

Further, caller identity authentication may be initiated by destination device **44**. Destination device **44** may include voice templates and a feature for performing the caller identity authentication. In addition, destination device **44** may access a third party server **49** via network **20**, where third party server **49** may provide access to a database of voice templates and/or perform the caller identity authentication. Destination device **44** will prompt a caller to provide a voice utterance at origin device **40**, where intermediary device **42** facilitates communications between origin device **40** and destination device **44**. Destination device **44** then determines and transmits a VID for the caller to intermediary device **42** for use in specifying services and billing for a call from origin device **40**. Destination device **44** may include a callee telephony device, a PBX, a call center, a private switching system, network servers, feature servers, and other systems which provide call receipt. Third party server **48** may include a telco application server, a generic application server, a database management system server, and other systems that function outside trusted telephone network **46**. In particular, intermediary device **42** may also facilitate

communication between destination device **44** and network **20**.

In the present invention, a VID preferably authenticates the identity of a caller. However, it is advantageous that the VID also include other information that provide a context for a call. For example, the GPS location or time zone of the caller location, the device from which the call is placed, the subject matter of the call, and whether the caller is calling on behalf of another, may be included in a VID. Further, the identity of the device that performed the identity authentication may be included in a VID.

A VID may be transferred in multiple protocols, including, but not limited to, Interface Definition Language (IDL). A VID may include a range of information, where each type of information may be tagged or identified in some other manner. For example, the following tagged VID may be transmitted to represent an authenticated identity of a caller:

[name] Jon Smith
[device] Jane Doe's cell phone
[service provider] Jon's wireless service provider G
[account provider] Credit account provider D, for device usage charges
[location] Central Time zone
[subject] Project A
[authenticated by] Jane Doe's cell phone, service provider G

CALLER BILLING CONTEXT

With reference now to **Figure 3**, there is depicted a block diagram of the flow of a billing plan in accordance with the method, system, and program of the present invention. As illustrated, origin device **40** transfers a call request to intermediary device **42**. The call request may be an off-hook condition for a wireline device and a network service connection request for a wireless device.

Initially, intermediary device **42** will respond to a call request by establishing a call register **50** for the call. Next, intermediary device **42** will respond by accessing the profile for the subscriber line associated with origin device **40**. In the example, the profile includes line subscriber billing plan **54** that is accessed and loaded into call register **50**. Line subscriber billing plan **54** may be accessed from a database within intermediary device **42** or by accessing a database outside trusted telephone network **46**.

However, once a VID is determined for the call, intermediary device **42** will respond by accessing the profile for the VID. In the example, the VID profile includes a VID billing plan **56** that is accessed and loaded into call register **50**. VID billing plan **56** may replace or supplement line subscriber billing plan **56** within call register **50**. The call is then processed according to the billing plans available in call register **50**.

VID billing plan **56** may be accessed from a VID based caller

profile stored within a database accessible within trusted telephone network **46**. In addition, VID billing plan **56** may be accessed from servers external to trusted telephone network **46**. In particular, a caller may choose to disclose billing information at multiple locations external to trusted telephone network **46**. In addition, a caller may choose to change billing information at systems management server **28** and other servers external to trusted telephone network **46**. For example, a caller may access management console **32** within systems management server **28** to update service and billing preferences according to VID. Intermediary device **42** may then access systems management server **28** to obtain billing information according to VID.

The VID based caller profile preferably includes a billing plan that indicates at least one service provider for the caller and rates provided to the caller by the service provider. The service provider preferably tracks usage of telephone services by the caller in order to charge the caller for use of services beyond that which is provided in a calling plan.

In addition, a billing plan may include account provider selections, such as caller account provider 62. Caller account provider 62 may be charged for telephone services and telephone usage. In particular, account providers preferably manage accounts according to VIDs, such that charges may be made to an account without requiring the caller to provide account information to the billing party.

Next, a service provider for the destination line number

indicated by a caller is determined by accessing a directory. The call is then switched to a destination device line number service provider call register **52**, that terminates the call to destination device **44**. As referenced above, the callee identified using destination device **44** may also be charged for use of measurable elements of destination device **44**, where an RVID profile indicating a billing plan for the callee is loaded into call register **52**. Further, a callee may charge a caller a tariff for the call, where the tariff reflects the use of destination device **44**.

According to an advantage of the present invention, origin device **40** includes a usage tracking device **41**. Usage tracking device **41** preferably tracks usage of measurable elements of origin device **40**. For example, the time that origin device **40** is in possession of the caller, the battery power utilized, the address book accesses, and usage of other measurable elements of origin device **40** are tracked by usage tracking device **41**. Alternatively, an IP or a service accessible outside trusted telephone network **46** may perform usage tracking.

Usage tracking device **41** reports usage of origin device **40** to intermediary device **42**, where intermediary device 42 routes the usage information to a billing service. In addition, usage tracking device **41** may calculate a tariff associated with the usage, such that the tariff is displayed to the caller while the call is in progress. Usage tracking device **41** preferably transfers the tariff calculation to intermediary device **42** for

charging a caller billing plan.

In response to receiving a tariff charge for a caller at call register **50**, a billing service 62 may be triggered. A billing service **62** may reside within intermediary device **42** in association with a service provider. Alternatively, a billing service **60** may reside outside trusted telephone network **46**, accessible via network **20**.

A billing service preferably receives billing requests and facilitates payment of those billing requests between parties. For example, the billing service may facilitate payment for usage of a telephony device by a caller from caller account provider **62** to a device owner account provider **61**. In addition, the billing service may facilitate payment for usage of a telephony device by a caller from caller account provider **62** in the form of an electronic micropayment transmitted to origin device **40**. The billing service may facilitate payments between other entities accessible via network **20** or within trusted telephone network **46**.

Referring now to **Figure 4**, there is an illustrative representation of the information within billing plans in accordance with the method, system, and program of the present invention.

In the example, in response to an origin line subscriber profile request, an origin line subscriber profile **55** is returned and stored within call register **50**. In the example, origin line subscriber profile **55** indicates the line number, the name of the

subscriber assigned to a line number, services requested for the origin line number, services blocked for the line number, and origin line subscriber billing plan **54**. In addition, origin line subscriber profile **55** indicates an identifier for the device owned and the tariffs that will be billed by the device.

Origin line subscriber billing plan **54** may include information including, but not limited to, selected service providers and other account providers. A billing plan may include one service provider utilized for general wireline service and another service provider utilized for long distance service. Further, a billing plan may include other account providers, such as a credit account provider for receiving tariffs charged for use of an origin device and/or origin line number.

According to an advantage of the present invention, the billing information for a call in call register **50** may be supplemented or replaced by VID billing plan **56**. In the example, the billing information for the VID replaces the billing information for the origin line subscriber, such that service provided to the caller may be billed to the caller, rather than the line subscriber.

In addition to billing information, VID and context information **58** may also be added to call register **50**. In the example, VID and context information **58** includes a VID ID, a VID name, the line number, and an identifier for the device. In alternate embodiments, additional billing, VID, and call context

information may be included in call register **50**. In particular, where the origin line subscriber and the caller are the same person, it is still advantageous to supplement call register **50** with VID and context information **58**.

According to one advantage of the present invention, the caller is billed for the telephone service provided to the origin device, rather than billing the line subscriber. According to another advantage of the present invention, each device owned by a line subscriber may have tariff charges associated therewith. In the example, tariff charges are associated with AJon Doe's personal cell phone.@ These tariff charges may be further specified according to caller. For example, a device owner may apply one set of charges to a friend utilizing the device and another set of charges to a stranger utilizing the device. The device owner may indicate a list of VIDs for friends, where callers not in the list of VIDs are charged a higher tariff rate for usage. In addition, the tariff charges may adjust over time, where if a caller utilizes the device for less than five minutes, then a first set of tariff charges apply, but after five minutes, a second, higher set of tariff charges apply.

In particular, where a caller billing plan includes more than one account provider or service provider than may be charged a tariff for device usage, the context of the call may indicate which service provider should be charged. For example, one account provider may be selected for tariff charges associated with business calls and another account provider selected for tariff charges associated with personal calls, where the context

of the call preferably includes whether the call is business or personal. Alternatively, the caller may be prompted to elect a provider for the tariff charges if one cannot be discerned from context.

With reference now to **Figure 5**, there is depicted a flow diagram of a signal flow and processing of a call in accordance with the method, system, and program of the present invention. A standard telephone device is assumed for the Atel@ origin device in the present example. However, a similar signal flow may be applied to other types of origin devices.

The caller lifts a handset creating an off-hook state in the origin device and a corresponding change in state of an off-hook signal to the origin central office (step S1). In response to detecting an off-hook state in the origin device, the origin central office establishes a register for the call and requests a line subscriber profile from the SCP and/or an external network server (step S2). A line subscriber profile including preferred services and a billing plan is returned to the origin central office (step S3). The central office loads the line subscriber profile into the call register (step S4) and extends a dial tone to the origin device (step S5).

The origin device then transmits dialed digits to the origin central office (step S6). A caller may utilize a keypad to enter a telephone number or utilize a voice dial feature if available. Dialed digits may be received at other points in the process and loaded into the call register until needed for processing the

call.

Next, the origin central office extends a caller authentication service request to an IP or to the telco application server (step S7). The caller authentication server will prompt a caller to provide a voice utterance, match the voice utterance with a voice template and authenticate the caller identity as a VID which is returned to the central office (step S8). Alternatively, the origin device or destination device may perform caller authentication, where the VID is received from the origin device or destination device.

The origin central office updates the call register with the VID and extends a request for a VID based profile to the SCP and/or external network servers (step S9). The VID based profile is returned from locations where the caller has selected to make VID based information available (step S10). The origin central office then loads the VID based profile, including service preferences and billing information, into the call register (step S11). In particular, if a service provider indicated in a caller billing plan is different than the service provider providing the line, then the call may be transferred to the service provider indicated in tne caller billing plan, where a new call register is created in the central office of the caller billing service provider.

Next, the central office processes the call (step S12). Processing the call entails providing the services requested by the current caller in the VID based profile. In addition,

processing the call requires determining the destination service provider assigned to the dialed digits. The call may be transferred to the destination service provider, where the destination service provider establishes a call register to terminate the call to a destination device.

When the end of a call is detected by the origin central office, an end of call signal is transmitted to the origin device (step S13). An end of call signal may be initiated by the origin or destination central office if, for example, a pre-paid account for long distance service is depleted. Alternatively, an end of call signal may be initiated by the caller or callee hanging up.

In response to detecting an end of call signal, the origin telephone transmits usage tracking information and tariffs attached thereto to the origin central office (step S14). The origin central office initiates a billing service within the IP or the telco application server to manage payment of the tariff (step S15). In particular, the billing service may access a billing plan for the caller, debit a service provider or account provider according to the caller VID and provide a payment to the line subscriber. Alternatively, where usage of the origin telephone is not associated with use during a call, the origin telephone may determine the VID for the caller and contact the central office with the VID and usage transaction information at any point. The central office triggers the billing service to complete the tariff transaction.

Referring now to **Figure 6**, there is depicted a block diagram

of a billing service in accordance with the method, system, and program of the present invention. As illustrated, billing service includes a device usage billing services controller **120**. Controller **120** preferably monitors device usage, receives requests for device usage tariffs according to VID or RVID, facilitates payments for device usage tariffs and records tariff usage billing.

A provider directory **122** preferably includes network addresses of account and service providers to enable controller **120** to facilitate billing to account and service providers. In addition, provider directory **122** may include ratings for account and service providers according to reliability in previous financial transactions.

A billing transaction database **124** preferably stores records device usage tariff billing transactions facilitated by controller **120**. In particular, records may be stored according to VID or RVID for reference in future transactions.

With reference now to **Figure 7**, there is illustrated a high level logic flowchart of a process and program for controlling a billing service according to the present invention. As depicted, the process starts at block **130** and thereafter proceeds to block **132**.

Block **132** illustrates a determination as to whether a billing service initiation request is received. The billing

service may be initiated by a setting in a caller profile, a setting in a line subscriber profile, a request automatically initiated by a device, or by other inputs. If an initiation request is received, then the process passes to block **134**.

Block **134** depicts starting a record for the billed transaction. Starting a record preferably includes recording the tariff amount and entity initiating the request. Next, block **136** illustrates receiving the authenticated identifiers of the caller and device owner. In particular, the authenticated identifiers may be filtered according to provide only that information needed by the billing service for processing the transaction.

Next, block **138** illustrates retrieving the billing plans according to the identifiers. The billing plans are preferably filtered according to the context of the call to select the account or service provider relevant to the transaction. Thereafter, block **140** depicts establishing a secure channel with selected account/service providers for facilitating a billed transaction from the caller account provider to the device owner. The payment may be made to an account provider, service provider or as a micropayment to the device. Further, block **142** illustrates completing the record of the transaction with a payment number received from the caller account provider, and the process ends.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will

appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention.